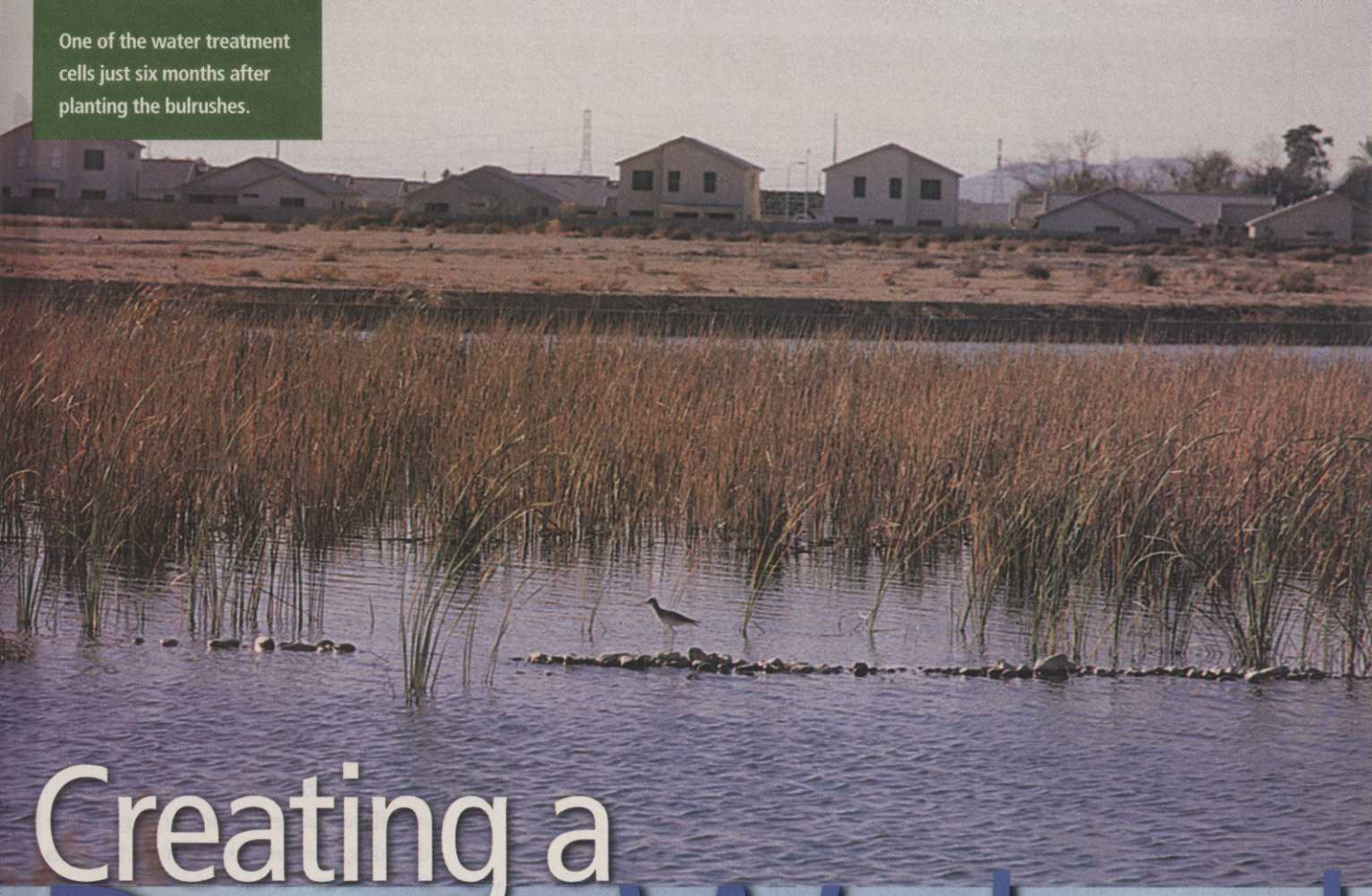

One of the water treatment cells just six months after planting the bulrushes.

Creating a Desert Wetland

BY DON DALE

Water destined for groundwater recharge basins must first have the nitrates and phosphates removed. These lakes are designed to do that, as well as provide landscaping for the growing subdivision.

It's an odd place to find wetlands, and it's no surprise that man created it. Right now, it looks like any other suburban development lake system, but eventually it will look more natural and help clean up water. The City of Avondale, AZ, built its Wetlands of Avondale right in the middle of the desert and the Crystal Gardens housing development. It's designed to help clean up river water before it goes into the city's water system.

"This was a cotton field, or whatever they were growing at the time," says Tom Georgio, Avondale facility director for the water treatment plant just west of Phoenix.

The wetlands is not a natural area in the traditional sense — it's a series of interconnected water treatment cells interspersed among housing lots, landscaped to provide water purification and an aquatic wildlife habitat.

Water from the Agua Fria River, destined for groundwater recharge basins, must first have nitrates and phosphates removed. The lakes are designed to do that, as well as provide landscaping for the growing subdivision.

"The plants will take out 'x' amount of nutrients, and you have bacteria and microbes that will take out the other nutrients," says senior water treatment operator Martin Nanna.

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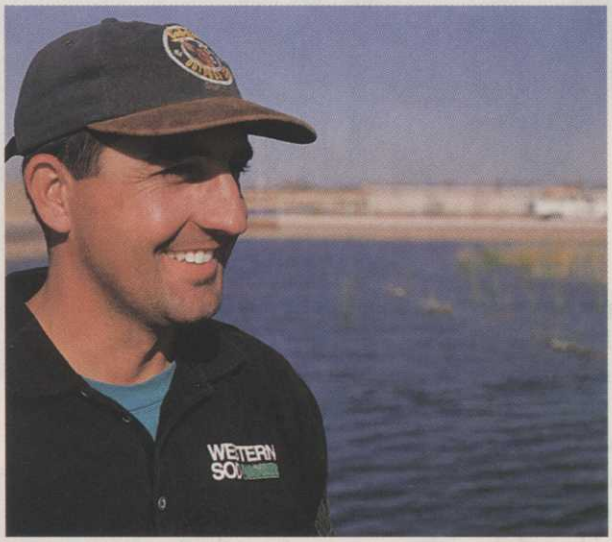
The system, designed by Integrated Water Technologies of Santa Barbara, CA, uses bulrushes to clean the water. But installing 121,290 plants was a big job because the lined lakes had no planting medium after excavation.

Bottoms of the 21 separate lakes, or cells — which cover 72.2 surface acres and vary in depth from 8 to 15 ft. — were lined with 30-mm PVC liner overlain with a geotextile mesh fabric that protects the liner. Textured concrete lines the sides of the cells, which are curbed to prevent overspill.

Islands in the centers of lakes selected for planting were built up inside rock retaining walls, and 13 in. of screened sand was laid down on top of the islands to provide a growing medium. "It was material that came out of the basins," Georgio says.



Patrick Murphree managed the installation of plants for the Avondale project.

The plants were the giant bulrush (Scirpus californicus), the three-square bulrush (Scirpus americanus) and the hard stem bulrush (Scirpus acutis).

The bulrushes were planted as tubers in the sand, 3 ft. apart, and water levels were slowly adjusted upward as the plants germinated and developed shoots. After the plants were up and thriving, the water was leveled off at 18 in. above the islands' sand base.

"We were trying to keep the soil saturated but not drown the plants," says Patrick Murphree, project manager for Western Sod, the contractor hired to install plants grown by a Colorado nursery for this project. Once the plants mature, they will spread by sending out rhizomes and new shoots.

Planting challenges

"You'll probably have better luck if you fluctuate water levels in the spring," Murphree says of encouraging new shoots in established bulrush populations. He notes that the tubers were planted with 15 grams of 23-13-0 slow-release granular fertilizer per plant.

"We dug a hole, dropped the fertilizer in and dropped the tuber in," he says.

The fertilizer was to last six months, after which the nutrients in the lake would supply all of the bulrushes' needs.

The different bulrush species were selected because each grows to a different height, giving the lakes a natural look. But the three-square bulrushes apparently didn't like the water level because they all died.

Some parts of the islands' bulrushes didn't germinate, Georgio says, because tubers were uprooted by wave action caused by high winds. That happened in areas where water leveled off above the sand. It's better to saturate the sand and not let the water surface at all during the sprouting period, he says.

A system with a purpose

Although the city owns the lakes and 15 ft. of land surrounding them, the subdivision's developer owns the adjacent land and is in charge of its vegetation. The developer planted the turf areas adjacent to the lakes as well as the trees. Turfed surrounds are designed as shallow trenches to catch runoff from streets before it can get into the lakes, preventing toxic petrochemicals from upsetting aquatic life.

Georgio says that 24-in. pipe connects the cells, which are designed so that all water flows by gravity, eliminating the need for pumps. On a normal day, 4 1/2 million gallons of water flow through the system. The system can handle 13 1/2 million total gallons.

"We can bypass the entire system and go right to the recharge," Georgio says of the facility, where construction started in 1996. The last cell was finished late in 1998.

Plant maintenance is still in the planning stages for the city, Georgio says. "They will be cut once or twice a year," he says, keeping the 8-ft. tall plants attractive. Sections of bulrushes in each lake will be cut alternately for aesthetic purposes, and plant material will be removed.

"It just makes a conducive environment for recharging water," says Nanna.

By the time the water goes through the lakes and seeps through the four sandy recharge basins nearby, it will be potable. At times, the water might even be drinkable after it leaves the treatment cells, but that isn't the purpose of the system. The city will get its drinking water from wells drilled near the recharge basins, complying

Tom Georgio, facility director for Avondale's water treatment plant.

with state groundwater protection laws.

Inlet and outlet pipes in each lake are positioned in the middle of the bulrush areas so that new water will be forced through the plants, providing maximum cleaning potential. All of the cells but one have been planted.

In addition, fish have been stocked in the lakes. There will be some urban fishing allowed, but the fish have other purposes.

"Some are for insect control and some are for algae control," Georgio says. Koy take care of the insects, and tilapia handle the algae.

Tim Thompson, vice president of Integrated Water Technologies and a designer of the project, says this is a unique water treatment system in that it uses bacteria on the bulrushes to clean the pollutants and is located in a residential subdivision.

"That's very new," Thompson says of the system's characteristics.

Two of the bulrushes are native to California and Arizona. They will go partly dormant during the winter and green up in the spring.

"It's a part of assuring our own water supply for growth," Georgio says of the water system for the city of 26,000, a number expected to double in five years. The cost of the system was about $11 million without landscaping, a huge savings over a conventional sewage treatment system.

The result is not an unsightly water treatment facility but an attractive lake system for Avondale that is home to a number of egrets, herons and other birds. LM